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Attorney Docket No. 102147  
17 Apr 14

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Serial Number 13/893,487  
Filing Date 14 May 2013  
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Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE <b>APR 2014</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-2014 to 00-00-2014</b>	
4. TITLE AND SUBTITLE <b>Stacked Buoyant Payload Launcher</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Technology Partnership Enterprise Office,Naval Undersea Warfare Center, 1176 Howell St.,Code 07TP, bldg. 102T,Newport,RI,025841</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>16</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

**STACKED BUOYANT PAYLOAD LAUNCHER**

**STATEMENT OF GOVERNMENT INTEREST**

**[0001]** The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

**CROSS REFERENCE TO OTHER PATENT APPLICATIONS**

**[0002]** None.

**BACKGROUND OF THE INVENTION**

**(1) Field of the Invention**

**[0003]** The present invention relates to underwater launching of payloads, and more particularly to stowing and launching of multiple buoyant payloads using existing submarine vertical missile tubes and capsule interfaces.

**(2) Description of the Prior Art**

**[0004]** Traditionally, submarine vertical payload tubes have been reserved for undersea launched missiles. Underwater deployment of smaller payloads has been limited to ejection from torpedo tubes, the trash disposal unit, the signal ejector, or through the escape hatch lockout trunk. Each of these deployment methods has disadvantages.

**[0005]** Torpedo tubes are generally horizontal. Thus, payloads must be fired from the tubes by using compressed air.

Accordingly, payloads need to be fortified to withstand the launching pressures of compressed air. Also, the compressed air blast makes a surreptitious payload launch practically unachievable. While a trash disposal unit does not require a compressed air blast to eject a payload, the disposal unit is configured to drop compacted trash payloads to the ocean floor. Thus, the use of buoyant payloads is generally precluded.

**[0006]** A typical signal ejector tube can accommodate payloads approximately three inches in diameter. Thus, payload size is extremely limited. The escape hatch lockout trunk can accommodate a man sized payload. However, the payload would need to be fitted within the hatch cowling, or hand released by a diver within the flooded hatch. Such a configuration would allow for only a single payload per launch.

**[0007]** What is needed is a system for launching a buoyant payload from a submarine that does not require a compressed air blast for launch. The payload should be launched towards the surface and the launch system should accommodate payload diameters greater than three inches. Additionally, the system should be capable of launching multiple payloads without the need for hands on loading.

#### **SUMMARY OF THE INVENTION**

**[0008]** Accordingly, it is a primary purpose and general object of the present invention to provide a submarine launch system for a buoyant payload.

**[0009]** It is a further object of the present invention to provide a system for launching a buoyant payload from a submarine that does not require a compressed air blast for launch.

**[0010]** It is a still further object of the present invention to provide a submarine launch system wherein the payload is launched towards the surface and the launch system accommodates payload diameters greater than three inches.

**[0011]** It is a still further object of the present invention to provide a submarine launch system capable of loading and launching multiple payloads.

**[0012]** In accordance with these and other objects made apparent hereinafter, a submarine buoyant payload launcher system is provided. The system is configured to fit the interior of a submarine missile capsule, which is then loaded into one of the vertical missile tubes of the submarine. By being outfitted within the missile capsule, the system makes use of existing mechanical and electrical capsule interfaces of the missile tube, as well as the loading, handling and special support equipment of the capsule.

**[0013]** The system includes support rails that extend longitudinally along the interior surface of a capsule. Payloads are configured to fit within the space bound by the rails and to be stacked within the support rails. A plurality of hold downs are spaced along the length of each rail. In an open position, the hold downs are retracted into the support rails and do not protrude into the space occupied by the payloads. With the hold

downs in their open position, a payload can be loaded within the rails.

**[0014]** Once a payload is in position within the rails, the hold downs adjacent to the top end of the payload are rotated to their closed position in order to contact the payload. A boss on the hold down fits into a detent in the top of the payload. Another payload can then be loaded within the rails until the payload contacts the closed hold downs. A shelf in the top of each hold down mates with a corresponding cutout on the bottom of the payload. As in the case of the first payload, the hold downs adjacent to the top end of this next payload are rotated to a closed position. Multiple payloads can be loaded within the rails in this manner.

**[0015]** Other objects, features and advantages of the present invention including various novel details of construction and combinations of parts, will now be more particularly described with reference to the accompanying drawings and pointed out in the claims. It will be understood that the particular assembly embodying the invention is shown by way of illustration only and not as a limitation of the invention. The principles and features of this invention may be employed in various and numerous embodiments without departing from the scope of the invention.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

**[0016]** Reference is made to the accompanying drawings in which are shown illustrative embodiments of the invention, from which its novel features and advantages will be apparent, wherein

corresponding reference characters indicate corresponding parts throughout the several views of the drawings and wherein:

[0017] **FIG. 1** is a top view of a buoyant payload launcher system of the present invention;

[0018] **FIG. 2** is a cross sectional view taken at reference line 2-2 in **FIG. 1**;

[0019] **FIG. 3** is front view of a hold down at a scale larger than shown in **FIG. 2**;

[0020] **FIG. 4** is a top view of a buoyant payload;

[0021] **FIG. 5** is a bottom view of a buoyant payload; and

[0022] **FIG. 6** is a top view of an alternate embodiment of a buoyant payload launcher system.

#### **DETAILED DESCRIPTION OF THE INVENTION**

[0023] Referring now to **FIG. 1**, there is shown a top view of a launcher system **10** configured to fit within an existing submarine missile capsule **1**. Support rails **12** of the launcher system **10** are equally spaced about interior surface **1a** of the capsule **1**. As described further hereinafter, hold downs **14** are rotatably mounted within the support rails **12** and secure payload **16** (illustrated in phantom in **FIG. 1**) within the support rails. As shown in **FIG. 1**, the payload **16** is configured and sized such that there is clearance between the rails **12** and the payload; thereby, allowing insertion of the payload into the system **10**.

[0024] Referring to **FIG. 2**, there is shown a cross sectional view of the launcher system **10**, taken at reference line 2-2 of **FIG. 1**. As described with respect to **FIG. 1**, the support rails **12**

are equally spaced within capsule **1**. For illustration of the embodiment shown in **FIGS. 1** and **2**, but not for limitation, the support rails **12** are configured in a channel shape. Web portions **12a** of the support rails **12** are mounted to the interior surface **1a** of capsule **1** and flanges **12b** extend towards center axis **X-X** of the capsule. The rails **12** extend longitudinally along the length of cylindrical capsule **1**.

[0025] The hold downs **14** are spaced along the length of each rail **12**. For clarity of illustration, cross-hatching of the hold downs **14** is omitted. As described with respect to **FIG. 1**, the hold downs **14** are rotatably mounted between the flanges **12b** of the rails **12**. In **FIG. 2**, three sets of hold downs **14** are illustrated in a closed position, including the top most set of the hold downs also illustrated in **FIG. 1**. Also in **FIG. 2**, three other sets of hold downs **14** are illustrated in the open position, including the lowermost hold downs. For clarity of illustration, reference numerals designate only the topmost and lowermost sets of the hold downs **14**.

[0026] In the open position, the hold downs **14** are aligned with longitudinal axis **X-X** of the capsule **1**. Also in the open position, the hold downs **14** lie adjacent to the webs **12a** and between the flanges **12b** of the rails **12**. With the hold downs **14** in this position; the payloads **16** (also shown in phantom in **FIG. 2**) can be inserted into the system **10** without interference from the hold downs **14** until coming into contact with lower supports **18**.



[0027] Once the payload **16** is secured against the lower supports **18**; the hold downs **14** immediately above the inserted payload **16** can be rotated 90 degrees to the closed position so as to contact the payload. Another payload **16** can be inserted into the system **10** until coming into contact with the hold downs **14** in the closed position. Again, the hold downs **14** immediately above the inserted payload **16** can be rotated 90 degrees to the closed position. Further payloads **16** can be similarly loaded.

[0028] Referring to **FIG. 3**, there is shown a larger scale front view of a hold down **14**. As described previously herein, the hold down **14** is rotatably connected between the flanges **12b** of the rails **12** via actuator pin **14a**. Rotation of the actuator pin **14a** is controlled by control unit **20** of the system **10** (shown in **FIG. 2**). The control unit **20** is configured to connect with the existing mechanical and electrical interfaces **1b** of capsule **1**.

[0029] The hold down **14** includes boss **14b** extending (downward in the orientation of **FIG. 3**) from arm portion **14c** of the hold down **14**. Additionally, shelf **14d** is opposed to the boss **14b** on the arm portion **14c**.

[0030] Referring also to **FIGS. 4** and **5**, there are shown respective top and bottom views of a payload **16**. The boss **14b** mates with detents **16a**, shown in top view (**FIG. 4**) of the payload **16**. Cutouts **16b**, shown in bottom view (**FIG. 5**) of the payload **16** mate with the shelf **14d**. The cutouts **16b** also mate with the lower supports **18** (shown in **FIG. 2**). Portions of two payloads **16** are shown in phantom in **FIG. 3** to illustrate the mating of payloads **16** with the boss **14b** and the shelf **14d**.

**[0031]** Once the payloads **16** have been inserted into the system **10**; the missile capsule **1** can be loaded into its missile tube using existing capsule loading equipment. To deploy the payloads **16**, the missile tube muzzle is exposed to the sea and the interior space within the capsule **1** is free flooded. A signal is provided to the control unit **20** (via the interfaces **1b**) to rotate the hold downs **14** that are mated with the detents **16a** of the uppermost payload **16** from a closed to open position. At this point, the buoyant payload **16** is free to float out of the system **10** and away from the missile tube. Any additional payloads **16** can be similarly released.

**[0032]** What has thus been described is a buoyant payload launcher system **10** that fits within an existing submarine missile capsule **1**. The capsule **1** containing the system **10** can be loaded into a submarine missile tube using the existing capsule loading equipment. The system control unit **20** connects with the existing capsule and missile tube interfaces **1b** such that payload launch signals can be communicated to the system **10**.

**[0033]** As the missile tube is merely flooded and the payloads **16** can float away from the submarine, no compressed air blast is needed for launch. The system **10** provides for launching payloads **16** having a greater diameter than can be launched from the signal ejector tube. Additionally, the system **10** can launch multiple payloads during one launch sequence, or can provide multiple launches at differing times.

**[0034]** The system **10** includes support rails **12** extending longitudinally along the interior surface the missile capsule **1**.

A plurality of hold downs **14** are spaced along the length of each rail **12** and are retracted into the support rails **12**. Once a payload **16** is in position within the rails **12**, the hold downs **14** adjacent the top end of the payload are rotated to their closed position, so as to contact the payload. By having a plurality of hold downs **14** spaced along the rails **12**, the system **10** is able to accommodate payloads **16** having a variety of lengths.

[0035] Another payload **16** can then be loaded within the rails **12**) until it comes into contact with closed hold downs **14**. As in the case of a first payload **16**, the hold downs **14** adjacent the top end of this next payload **16** are then rotated to their closed position. Multiple payloads **16** can be loaded within the rails **12** in this manner.

[0036] The foregoing description of the preferred embodiments of the invention has been presented for purposes of illustration and description only. It is not intended to be exhaustive or to limit the invention to the precise form disclosed; and obviously many modifications and variations are possible in light of the above teaching.

[0037] For example, **FIG. 1** illustrates four rails **12** having a channel shape and spaced equally within the capsule **1**. The number of rails **12** and their exact configuration and shape can be modified, with a minimum of three rails providing adequate lateral support for the payloads **16**, and providing for rotatably mounting the hold downs **14** thereto. **FIG. 6** shows a top view of an alternate embodiment of system **10'**, wherein the four support rails **12** of **FIG. 1** are replaced with three sets of rails **12'** configured

in back to back angle shapes mounted within capsule **1'**. Hold downs **14'** are rotatably mounted between flanges **12b'** of the rails **12'**. As in **FIG. 1**, the hold downs **14'** secure payload **16'** between the support rails **12'**.

**[0038]** Also, the system **10** is described herein as being mounted to inner surface **1a** of missile capsule **1**. Alternatively, the system **10'** can be self-supporting by providing supports between the rails **12'** independent from surface **1a'**, such as by one or more ring supports **22'** shown in **FIG. 6**. In this manner, the system **10'** can be removed from the capsule **1'** for maintenance or replacement as necessary.

**[0039]** It will be understood that many additional changes in the details, materials, steps and arrangement of parts, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

**STACKED BUOYANT PAYLOAD LAUNCHER**

**ABSTRACT OF THE DISCLOSURE**

A submarine buoyant payload launcher system includes support rails extending longitudinally along an interior surface of a submarine missile capsule. A plurality of hold downs are spaced along the length of each rail and are retractable into the support rails. Once a payload is in position within the rails, the hold downs adjacent to the top end of the payload are rotated to their closed position, so as to contact the payload. Another payload can then be loaded within the rails until the payload contacts with the closed hold downs. As in the case of the first payload, the hold downs adjacent to the top end of this next payload are rotated to their closed position. Multiple payloads can be loaded within the rails in this manner.

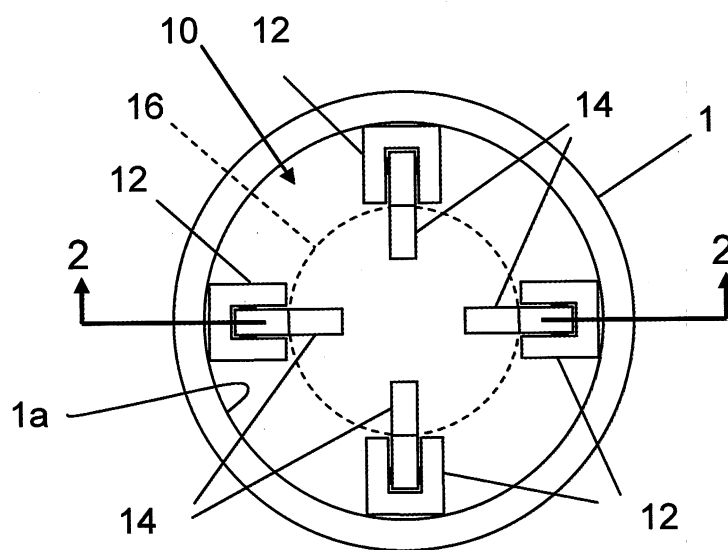


FIG. 1

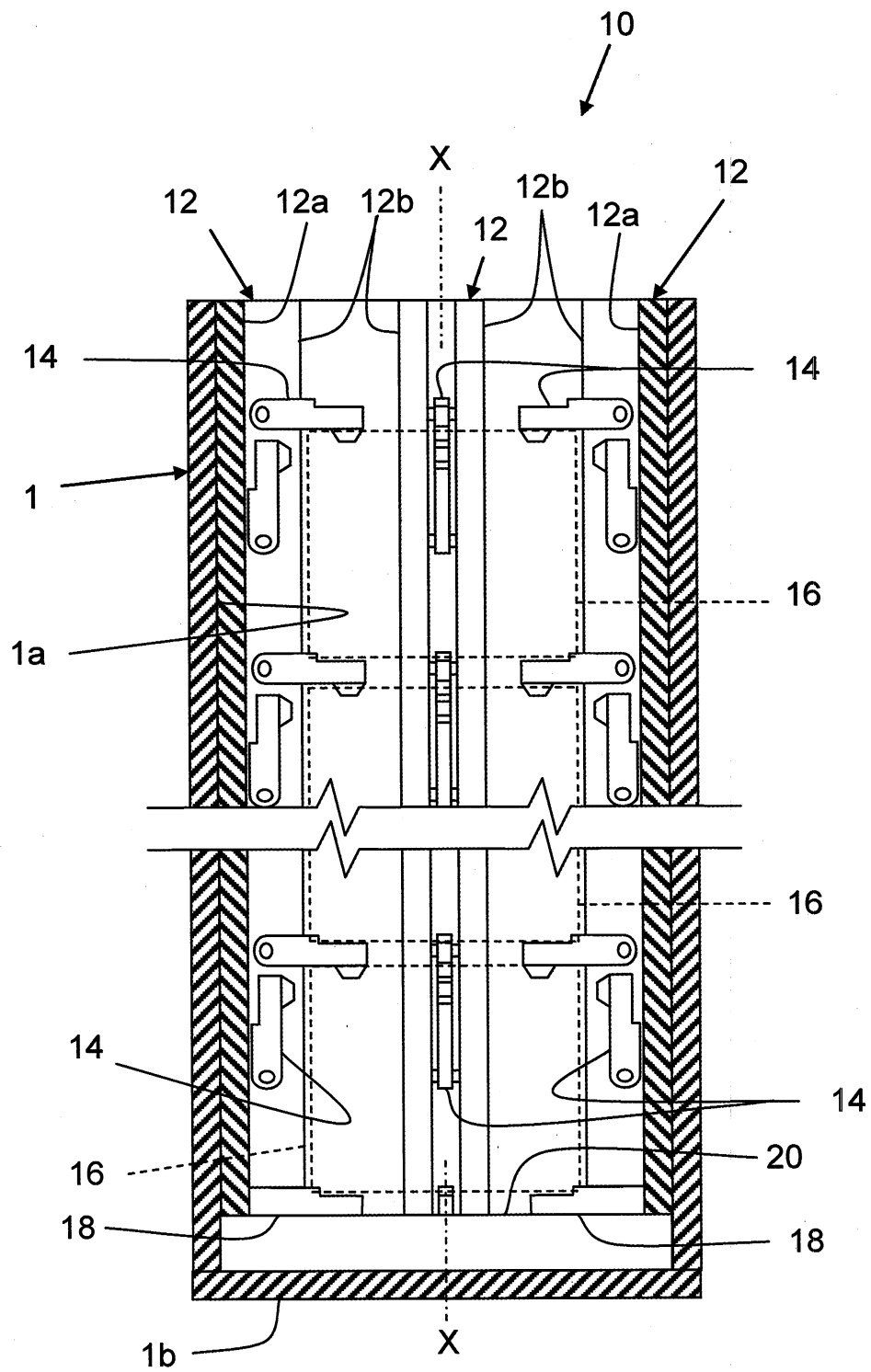


FIG. 2

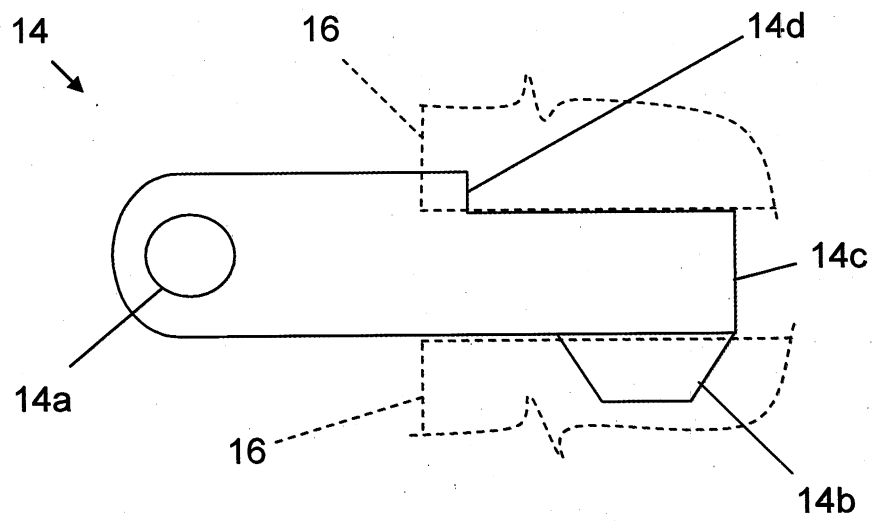


FIG. 3

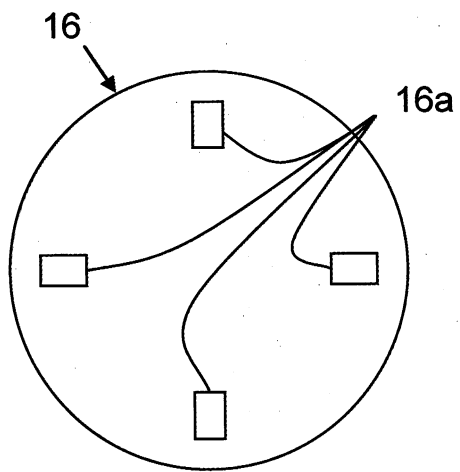


FIG. 4

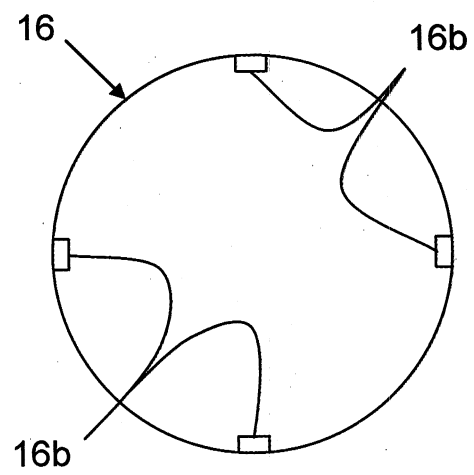


FIG. 5



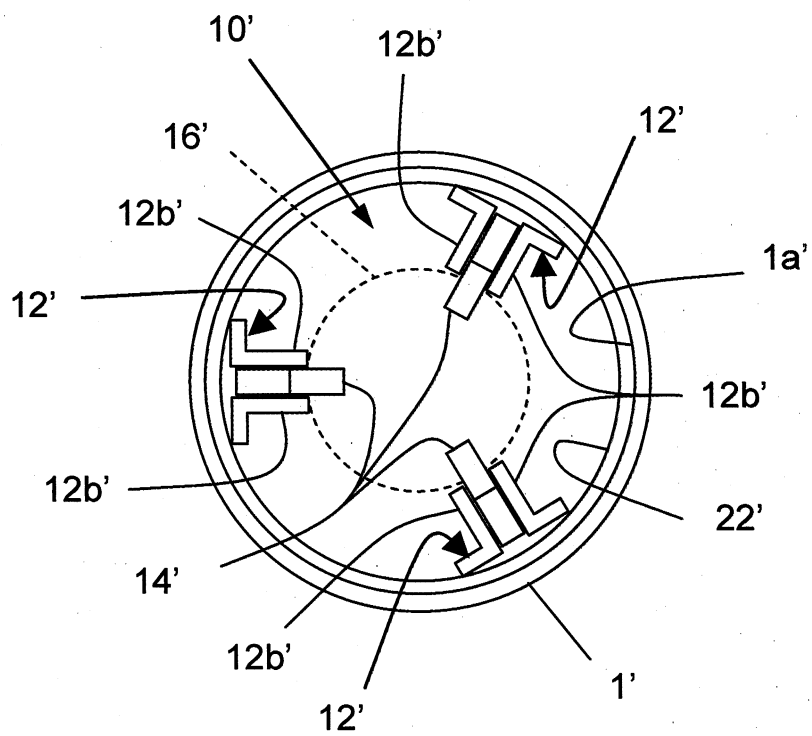


FIG. 6